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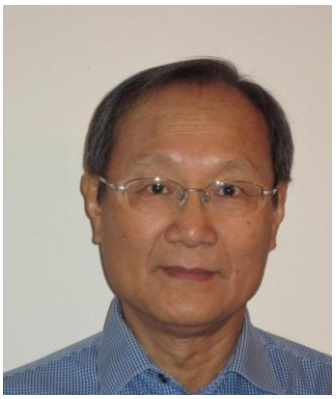
Magnetic Reconnection in Solar and Laboratory Plasmas



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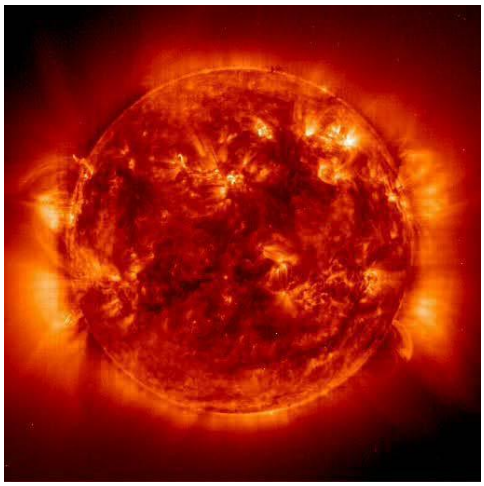
Dr. C. Z. Cheng (陳秋榮) is the Chair Professor at National Cheng Kung University, and aVisiting Professor at the University of Toky. He obtained his Ph.D. in Physics from University of Iowa in 1969. He was the Director of the Plasma and Space Science Center and also the Director of the Satellite Geoinformatics Research Center at the National Cheng Kung University. He received the Award for Excellence In Plasma Physics Research from American Physical Society in 2004. He is a PPPL Distinguished Research Fellow, a American Physical Society Fellow, and a Fellow of the Physical Society of the Republic of China. Dr. Cheng's area of expertise is in theoretical and computational plasma physics with applications in fusion research and space physics. He has published more than 260 papers in plasma physics, space physics and computational physics, and has presented over 350 invited and contributed papers at various scientific meetings and conferences.



Abstract

Magnetic reconnection is a key physical process to transfer plasma mass, momentum, and energy in plasmas. During magnetic reconnection, magnetic energy is converted into plasma energy by particle heating and acceleration. Some reconnection phenomena have quite steady reconnection rate, but most violent energy release phenomena are associated with (non-steady) impulsively fast magnetic reconnection. In the solar system plasmas, solar flares and coronal mass ejections (CME) are the most violent energy and plasma mass release phenomena by magnetic reconnection. The reconnection rate increases rapidly in the explosive flare phase together with the acceleration of the flux rope (CME) motion and then decays in the main phase of the flares together with CME deceleration. In large flares (X-class) the reconnection electric field is enhanced explosively to a few kV/m, which can accelerate particles along the field lines in the reconnection current sheet to MeV or even GeV energy.

Detailed measurement of magnetic reconnection process has been studied extensively in laboratory plasma merging experiments. In particular, in the University of Tokyo magnetic merging experiments, impulsively fast magnetic reconnection has been identified to be associated with the acceleration of flux rope ejection velocity. The reconnection electric field can reach several tens of V/m for merging poloidal magnetic fields of ~ 100 Gauss, and is proportional to the merging magnetic field strength.

All are welcome! Tea, coffee, biscuits will be served at 2:15 P.M.

You are welcome to nominate speakers to Weimin Yuan (wmy@nao.cas.cn), Mei Zhang (zhangmei@bao.ac.cn), Licai Deng (licai@bao.ac.cn), Xuelei Chen (xuelei@cosmology.bao.ac.cn), Shude Mao (smao@nao.cas.cn)